CLAIMS

What is claimed is:

1. Soliton transmission system comprising:

putting together two or more short pulses so that they form a group of partially overlapping pulses, said pulses being electromagnetic radiation pulses, such as laser light pulses, and having a same wavelength;

transmitting data by repeating modulated said pulse group type pulse groups in a pulse train, so that said modulated pulse groups are sent as solitons, the data being encoded in said pulse groups by modulating:

(a) individual pulses in a said pulse group,

(b) and / or, the pulses of a said pulse group as a group;

receiving said soliton type modulated pulse groups and decoding data carried by them.

2. Soliton transmission system according to claim 1 comprising:

wherein individual pulses in a said modulated pulse group are optionally modulated by using one or more of the following:

(a) position modulation,

(b) phase modulation,

(c) width modulation,

(d) amplitude modulation,

(e) polarization modulation;

wherein a said modulated pulse group itself is optionally modulated by using one or more of the following:

(a) position modulation,

(b) phase modulation,

(c) width modulation with respect to the width of said pulse group,

(d) width modulation with respect to the average width of the pulses in said pulse group,

(e) amplitude modulation with respect to the highest amplitude of the pulses in said pulse group,

(f) amplitude modulation with respect to the average amplitude of the pulses in said pulse group,

(g) pulse number modulation with respect to the number of pulses in said pulse group;

wherein if individual pulses in a said modulated pulse group are not polarization modulated, then said modulated pulse group itself is optionally modulated with polarization modulation in addition to other used modulations;

wherein if said (g) type pulse number modulation is used, then it is optionally used a normal soliton to denote the case where the number of pulses in the pulse group is one.

3. Soliton transmission system according to claim 2 comprising:

using said modulated pulse groups as components of data packets in packet based networks, like the Internet, one or more said modulated pulse groups forming one data packet;

in optical transmission, optionally switching optically said modulated pulse group based data packets with respect to the polarization states of the pulses forming said modulated pulse groups in a data packet;

using the following packet switching system for packet based networks, especially for wide area networks, like the internet, for switching said modulated pulse group based data packets:

wherein certain node computers use a delivery address prediction method wherein a node computer reads / resolves one or more of the following packet properties:

(a) the delivery addresses,

(b) the source addresses,

(c) the delivery routes,

(d) the content types,

(e) or, other packet properties,

of certain percentage or certain number of packets, said sample packets picked from an incoming packet train received from other node computer, said sampled packet property information being used for predicting intermediate and final delivery addresses for the packets which delivery addresses are not read in said packet train (which are called here probabilistically relayed packets);

wherein the node computers switch said probabilistically relayed packets according to said intermediate or final delivery address predictions to respective outgoing port(s) leading to said predicted delivery addresses;

wherein the node computers switch normally said sampled packets which delivery addresses are known, to their respective outgoing port(s);

wherein the node computers optionally read only partly:

(a) the delivery address,
(b) the source address,
(c) the content type description,
(d) or, other property,

of each of or some of said sample packets in said received packet trains, and use that information in said delivery address prediction;

wherein for some packets in said received packet trains it is optionally not used said delivery address prediction method based switching;

wherein the node computers use a packet interleaving method, wherein a node computer purposely interleaves certain number(s) of incoming packets sequentially from other node computers with respect to one or more of the following:

(a) the delivery addresses of said packets,
(b) the source addresses of said packets,
(c) the delivery routes of said packets,
(d) the content types of said packets,
(e) other properties of said packets,
(f) said other node computers itself,

in order to cause the positions of said packets in the relayed packet train(s) to follow any kind of predictable pattern(s) or algorithm(s) with respect to the individual data values of said packets for said property(ies) chosen from (a) through (f) which are used as the basis of said interleaving;

wherein the node computers choose and use in said delivery address prediction method certain predictive patterns or algorithms which predict best the delivery addresses of said probabilistically relayed packets;

wherein the node computers determine dynamically in real-time, ratings for the degree of delivery address prediction reliability (DDAPR) for said probabilistically relayed packets or packet groups, such ratings chosen on the basis of a goodness of fit which defines how well the intermediate and final delivery addresses of the most recent said sample packets picked from an incoming packet train follow a said chosen predictive pattern or algorithm, and how well certain of said probabilistically relayed packets' intermediate and final delivery addresses can be predicted using a said chosen predictive pattern or algorithm;

wherein the node computers optionally sample more packets in said delivery address prediction method when the calculated DDAPR(s) is lower;

wherein the node computers divide the incoming and outgoing packet trains to packet channels for example using time division, carrier frequency division, code division or wavelength division, so that it is reserved:

(a) a separate channel for the packets which delivery addresses have been read,

(b) a separate channel for the packets which delivery addresses have been read and for which it must not be used said delivery address prediction method,

(c) and, multiple separate channels for said probabilistically relayed packets, each of said multiple channels delivering packet trains with different rating for said DDAPR;

wherein when the node computers receive said channeled type (a) and (c) packet trains, they use said delivery address prediction method which uses said dynamical DDAPR calculation relaying the packets in said packet trains as said type (a), (b) or (c) packet trains;

wherein when the node computers receive said channeled type (c) packet trains, the packets chosen for probabilistic relay in said packet trains are given new said dynamical DDAPR ratings which are optionally adjusted with the old DDAPR ratings which said packet trains already have when received, wherein in said adjustment a said determined new dynamical DDAPR rating is lowered by a certain amount relative to a said old DDAPR rating of a said type (c) packet train channel having the packet or packet group for which said new dynamical DDAPR rating was determined;

wherein said old DDAPR ratings itself are optionally lowered certain amount for said received channeled type (c) packet trains to take account the effect of the degrading of validity of DDAPR when packets travel more times between node computers without their delivery addresses being read;

wherein the node computers read delivery addresses of all packets with too low DDAPR, and relay them through said type (a) or (b) packet train channels;

wherein the node computers optionally reserve more bandwidth (transfer capacity) for said type (c) packet train channels which have higher said DDAPR ratings;

wherein the node computers optionally send to each other information about the occurrence regularities / algorithms and occurrence probabilities of:

(a) packet delivery addresses,

(b) packet source addresses,

(c) or, other packet properties,

in the packet traffic between the node computers to avoid unnecessary sampling of packets in incoming packet trains, to better predict packet delivery addresses and to switch as many packets as possible without reading their delivery addresses or other properties;

wherein in order to form regularities to the packet traffic, the node computers optionally deliver:

(a) through certain node computers,

(b) or, through certain routes via node computers,

the packets which have certain types of:

(a) intermediate or final delivery addresses,

(b) source addresses,

(c) content,

(d) or, other properties;

wherein in order to control the overall capacity usage of the network of the node computers, the node computers optionally deliver:

(a) through certain node computers,

(b) or, through certain routes via node computers,

said channeled type (c) packet trains with certain DDAPR ratings;

wherein the node computers optionally deliver data packets according to a system, wherein in the header or other section of a packet is written occurrence information about the delivery addresses or other properties of the subsequent packets in the packet train containing said packet;

wherein said occurrence information is written by the node computers whenever it is needed;

wherein said occurrence information is read by the first switching node computer which receives the packet holding said occurrence information from the node computer which has written said occurrence information;

wherein when receiving a packet containing said occurrence information the node computers read and use it, and either write over said used occurrence information with new occurrence information or empty information, or write in said packet an identifier which denotes that said used occurrence information is obsolete;

wherein said occurrence information tells how many and / or what packets have certain or certain type of intermediate or final delivery addresses, or other properties;

wherein said occurrence information appoints the packets to which it refers by a certain pattern or algorithm according to which said packets are picked from said packet train;

wherein said occurrence information is used in said delivery address prediction method:

(a) to predict intermediate or final delivery addresses of packets,

(b) or, independently with or without said delivery address prediction method for switching as many packets as possible without reading their delivery addresses;

wherein the node computers optionally deliver data packets according to a system, wherein in the header or other section of a packet is written a referring pointer denoting the intermediate or final delivery address, or other property of that packet containing said referring pointer;

wherein said referring pointer refers either:

(a) to an intermediate or final delivery address, or other property of a specific packet among the number n latest packets residing in the same packet train before said packet holding said referring pointer,

(b) or, to a specific intermediate or final delivery address, or other packet property in an index of the most frequent recent intermediate or final delivery addresses, or other packet properties which have occurred in the packet traffic between two node computers carrying also said referring pointer holding packet;

wherein a said referred delivery address or other property (a) or (b) is used as the delivery address or other property of the packet containing said referring pointer;

wherein said referring pointer is written by the node computers whenever it is needed;

wherein said referring pointer is read by the first switching node computer which receives the packet holding said referring pointer from the node computer which has written said referring pointer;

wherein when receiving a packet containing said referring pointer the node computers:

(a) read it and use it in delivery address or other property determination of said packet,

(b) and, either write over said used referring pointer with new referring pointer or empty information, or write in said packet an identifier which denotes that said used referring pointer is obsolete;

wherein some node computers optionally form groups, each group having a common said (b) type index for said (b) type delivery address or other packet property referring, which contains the

most frequent recent intermediate or final delivery addresses, or other packet properties having occurred in the packet traffic in said node computer group;

wherein in said node computer group, the node computers deliver to each other information about said most frequent recent intermediate or final delivery addresses, or other packet properties to form identical said (b) type indices;

wherein when said (b) type common index system is used for node computer groups, the node computers in a group do not write over or mark as obsolete said (b) type referring pointers after reading and using them, instead said (b) type referring pointers are used again by other node computers inside said group along the route of the packet holding said (b) type referring pointer;

wherein when said (b) type common index system is used for node computer groups, outside of the groups is used said two node computer referring pointer system if any;

wherein said two node computer referring pointer system and said node computer group referring pointer system are used in said delivery address prediction method:

(a) to predict intermediate or final delivery addresses of packets,

(b) or, independently with or without said delivery address prediction method for switching as many packets as possible without reading their delivery addresses.

4. Packet switching system for packet based networks, especially for wide area networks like the Internet, comprising:

wherein certain node computer(s) use a delivery address prediction method wherein a node computer reads / resolves one or more of the following packet properties:

(a) the delivery addresses,

(b) the source addresses,

(c) the delivery routes,

(d) the content types,

(e) or, other packet properties,

of certain percentage or certain number of packets, said sample packets picked from an incoming packet train received from other node computer, said sampled packet property information being

used for predicting intermediate and final delivery addresses for the packets which delivery addresses are not read in said packet train (which are called here probabilistically relayed packets);

wherein a node computer switches said probabilistically relayed packets according to said intermediate or final delivery address predictions to respective outgoing port(s) leading to said predicted delivery addresses;

wherein a node computer switches normally said sampled packets which delivery addresses are known, to their respective outgoing port(s);

wherein a node computer optionally reads only partly:

(a) the delivery address,
(b) the source address,
(c) the content type description,
(d) or, other property,

of each of or some of said sample packets in the received packet trains, and use that information in said delivery address prediction;

wherein a node computer optionally does not use said delivery address prediction method based switching for some packets in the received packet trains.

5. Packet switching system for packet based networks, especially for wide area networks like the Internet, comprising:

wherein certain node computer(s) use a packet switching method, wherein a node computer determines the outgoing ports for the received packets on the basis of one or more of the following properties of said packets:

(a) source addresses,
(b) content types,
(c) other properties which are not delivery addresses;

wherein it is optionally used the other or both of the following properties of said packets as the basis of said determination of said outgoing ports in addition to said first property(ies) chosen from (a) through (c):

(a) intermediate delivery addresses,

(b) final delivery addresses;

wherein a node computer switches said received packets to respective said determined outgoing ports.

6. Packet switching system for packet based networks, especially for wide area networks like the Internet, comprising:

wherein certain node computers deliver data packets according to a system, wherein in the header or other section of a packet is written occurrence information about the subsequent packets in the packet train containing said packet;

wherein said occurrence information tells how many and / or what packets have:

(a) certain or certain type of intermediate or final delivery addresses,

(b) and / or, other properties;

wherein when receiving a packet containing said occurrence information a node computer reads said occurrence information and switches certain subsequent packet(s) in the same packet train to the respective outgoing port(s) as instructed in said occurrence information, and optionally either:

(a) writes over said used occurrence information with new occurrence information or empty information,

(b) or, writes in said packet an identifier which denotes that said used occurrence information is obsolete.

7. Packet switching system for packet based networks, especially for wide area networks like the Internet, comprising:

wherein certain node computers deliver data packets according to a system, wherein in the header or other section of a packet is written a referring pointer denoting:

(a) the intermediate or final delivery address,

(b) and / or, other property,

of that packet containing said referring pointer;

wherein said referring pointer refers either:

(a) to an intermediate or final delivery address, and / or other property of a specific packet among the number n latest packets residing in the same packet train before said packet holding said referring pointer,

(b) or, to a specific intermediate or final delivery address, and / or other packet property in an index of the most frequent recent intermediate or final delivery addresses, and / or other packet properties which have occurred in the packet traffic between two node computers carrying also said referring pointer holding packet;

wherein when receiving a packet containing a said referring pointer a node computer reads said referring pointer and switches said packet to the respective outgoing port on the basis of said referring pointer, and optionally either:

(a) writes over said used referring pointer with new referring pointer or empty information,

(b) or, writes in said packet an identifier which denotes that said used referring pointer is obsolete;

wherein some node computers optionally form groups, each group having a common said (b) type index for said (b) type delivery address or other packet property referring, which contains the most frequent recent intermediate or final delivery addresses, and / or other packet properties having occurred in the packet traffic in said node computer group.